imperceptible. In order to learn the characteristics of the reduction process, it is desirable to consider next reduction of the pure oxide of each individual substance.

Pure iron oxide mixed with carbon and heated in such a manner that the carbon has not other more easily accessible sources of oxygen at disposal, gives up its oxygen to the carbon already at a little more than 400°, and is converted into metallic iron. The action proceeds according to the formulae

Fe208+8C=2Fe+8CO,

or

FeO+C^Fe+CO.

The reduction, nevertheless, could not in this manner embrace the entire amount of the iron oxide employed, if the resultant oxidisation product of the carlon did not essentially swpport the process. Carlon monoxide CO is likewise a reducing agent, it is as a gas capable of forcing its way into the iron oxide, and therefore of attacking all the molecules thereof, which otherwise would not be aUe to come in direct contact with the carbon; the action proceeds according to the equation

Fe203+3CO=2Fe+3C02.

The 00$ formed and the excess of CO escape out of the reaction zone. If the temperature rises high enough, so the reduced iron fuses together into an adherent mass. In this case, however, it dissolves a considerable amount of carbon and chemically combines itself with it, so that this carbon cannot be again removed from the iron.

In addition, all oxides practically employed for reduction, as well as also the carbon, contain impurities of which silicic acid, phosphoric acid, and manganese oxide take a share in reactions. The substances named are the products of oxidisation of silicon, phosphorus and manganese, and they likewise give off their oxygen under the circumstances to the reducing agent. If one allows in the presence of carbon at incipient white heat, and an absence of oxygen, pure phosphoric acid to make its appearance, carbon will remove the oxygen from this and phosphorus escape in its pure condition, in the form of vapour, together with carbon monoxide.